

REDLINE VERSION



Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.100; 45.060.01

ISBN 978-2-8322-5406-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions	7
3.2 Abbreviated terms	7
4 Performance criteria	8
5 Conditions during testing	8
6 Applicability	8
7 Emission tests and limits	9
8 Immunity tests and limits requirements	14
Annex A (informative) Examples of apparatus and ports	19
Annex B (informative) Conducted disturbances generated by power converters in the range of 9 kHz to 30 MHz	25
Figure 1 – Main categories of ports	7
Figure A.1 – AC fed locomotive traction unit with AC traction drive and psophometric filter on the line side	22
Figure A.2 – AC/AC system with power factor correction filter on the converter side and with DC or three-phase auxiliary and train power supply	22
Figure A.3 – Conventional system with AC input and DC traction motors fed by phase control converter	23
Figure A.4 – DC fed system with AC traction drive	23
Figure A.5 – Additional ports of converter and control electronics	24
Figure B.1 – Test set-up	26
Table – Emission – Traction a.c. power ports	13
Table – Emission – Traction d.c. power ports	13
Table – Emission – Auxiliary a.c. or d.c. power ports	13
Table – Emission – Battery referenced ports	13
Table – Emission – Process measurement and control ports	13
Table – Emission – Enclosure port	13
Table 1 – Emission – Auxiliary AC or DC power ports (input and output)	13
Table 2 – Emission – Battery power supply (input and output)	13
Table 3 – Immunity – Battery referenced ports (except at the output of energy sources), auxiliary AC power input ports (rated voltage $\leq$ 400 480 V _{r.m.s.})	15
Table 4 – Immunity – Signal and communication, process measurement and control ports	16
Table 5 – Immunity – Enclosure ports	17
Table A.1 – Typical examples of apparatus	20
Table A.2 – Typical port descriptions	21
Table B.1 – Emission requirements for AC and DC power ports	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
ELECTROMAGNETIC COMPATIBILITY –****Part 3-2: Rolling stock – Apparatus****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

DISCLAIMER

This Redline version is not an official IEC Standard and is intended only to provide the user with an indication of what changes have been made to the previous version. Only the current version of the standard is to be considered the official document.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62236-3-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition published in 2008. It constitutes a technical revision and has been developed on the basis of EN 50121-3-2:2015.

This edition includes the following significant technical changes with respect to the previous edition:

- a) clarification of scope (Clause 1);
- b) new definition of ports and clarification in Tables 1 to 5;
- c) emission requirement extended in the frequency range 1 GHz to 6 GHz following IEC 61000-6-4;
- d) immunity requirement extended in the frequency range 5,1 GHz to 6 GHz;
- e) revision of Annex B.

This International Standard is to be read in conjunction with IEC 62236-1.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2338/FDIS	9/2368/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62236 series, published under the general title *Railway applications – Electromagnetic compatibility*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 3-2: Rolling stock – Apparatus

1 Scope

This part of IEC 62236 applies to emission and immunity aspects of EMC for electrical and electronic apparatus intended for use on railway rolling stock. IEC 62236-3-2 applies for the integration of apparatus on rolling stock.

The frequency range considered is from DC to 400 GHz. No measurements need to be performed at frequencies where no requirement is specified.

The application of tests ~~shall~~ depends on the particular apparatus, its configuration, its ports, its technology and its operating conditions.

This document takes into account the internal environment of the railway rolling stock and the external environment of the railway, and interference to the apparatus from equipment such as hand-held radio-transmitters.

If a port is intended to transmit or receive for the purpose of radio communication (intentional radiators, e.g. transponder systems), then the ~~radiated emission and immunity limits in this standard at the communication frequency do not apply~~ requirement in this document is not intended to be applicable to the intentional transmission from a radio-transmitter as defined by the ITU.

Immunity limits do not apply in the exclusion bands as defined in the corresponding EMC related standard for radio equipment.

This document does not apply to transient emissions when starting or stopping the apparatus.

The objective of this document is to define limits and test methods for electromagnetic emissions and immunity test requirements in relation to conducted and radiated disturbances.

These limits and tests represent essential electromagnetic compatibility requirements.

Emission requirements have been selected so as to ensure that disturbances generated by the apparatus operated normally on railway rolling stock do not exceed a level which could prevent other apparatus from operating as intended. The emission limits given in this document take precedence over emission requirements for individual apparatus on board the rolling stock given in other standards.

Likewise, the immunity requirements have been selected so as to ensure an adequate level of immunity for rolling stock apparatus.

~~The levels do not however cover extreme cases which may occur with an extremely low probability of occurrence in any location. Specific requirements which deviate from this standard shall be specified.~~

Test requirements are specified for each port considered.

These specific provisions are ~~to be~~ used in conjunction with the general provisions in IEC 62236-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60571:2012, *Railway applications – Electronic equipment used on rolling stock*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-30:2015, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*

~~IEC 61000-6-1, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light industrial environments*~~

IEC 61000-6-4:2006, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61000-6-4:2006/AMD1:2010

IEC 62236-1:2018, *Railway applications – Electromagnetic compatibility – Part 1: General*

IEC 62236-3-1:2018, *Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle*

~~CISPR 11, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*~~

~~CISPR 16 (all parts), *Specification for radio disturbance and immunity measuring apparatus and methods*~~

CISPR 16-2-1:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

~~CISPR 22, Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement~~

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Railway applications – Electromagnetic compatibility –
Part 3-2: Rolling stock – Apparatus**

**Applications ferroviaires – Compatibilité électromagnétique –
Partie 3-2: Matériel roulant – Appareils**

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions	6
3.2 Abbreviated terms	7
4 Performance criteria	8
5 Conditions during testing	8
6 Applicability	8
7 Emission tests and limits	8
8 Immunity requirements	11
Annex A (informative) Examples of apparatus and ports	15
Annex B (informative) Conducted disturbances generated by power converters	21
 Figure 1 – Main categories of ports	 7
Figure A.1 – AC fed traction unit with AC traction drive and psophometric filter on the line side	18
Figure A.2 – AC/AC system with power factor correction filter on the converter side and with DC or three-phase auxiliary and train power supply	18
Figure A.3 – Conventional system with AC input and DC traction motors fed by phase control converter	19
Figure A.4 – DC fed system with AC traction drive	19
Figure A.5 – Additional ports of converter and control electronics	20
Figure B.1 – Test set-up	21
 Table 1 – Emission – Auxiliary AC or DC power ports (input and output)	 10
Table 2 – Emission – Battery power supply (input and output)	10
Table 3 – Immunity – Battery referenced ports (except at the output of energy sources), auxiliary AC power input ports (rated voltage $\leq 480 V_{r.m.s.}$)	12
Table 4 – Immunity – Signal and communication, process measurement and control ports	13
Table 5 – Immunity – Enclosure ports	14
Table A.1 – Typical examples of apparatus	16
Table A.2 – Typical port descriptions	17
Table B.1 – Emission requirements for AC and DC power ports	21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS –
ELECTROMAGNETIC COMPATIBILITY –****Part 3-2: Rolling stock – Apparatus****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62236-3-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

This third edition cancels and replaces the second edition published in 2008. It constitutes a technical revision and has been developed on the basis of EN 50121-3-2:2015.

This edition includes the following significant technical changes with respect to the previous edition:

- a) clarification of scope (Clause 1);
- b) new definition of ports and clarification in Tables 1 to 5;
- c) emission requirement extended in the frequency range 1 GHz to 6 GHz following IEC 61000-6-4;
- d) immunity requirement extended in the frequency range 5,1 GHz to 6 GHz;

e) revision of Annex B.

This International Standard is to be read in conjunction with IEC 62236-1.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2338/FDIS	9/2368/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62236 series, published under the general title *Railway applications – Electromagnetic compatibility*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

RAILWAY APPLICATIONS – ELECTROMAGNETIC COMPATIBILITY –

Part 3-2: Rolling stock – Apparatus

1 Scope

This part of IEC 62236 applies to emission and immunity aspects of EMC for electrical and electronic apparatus intended for use on railway rolling stock. IEC 62236-3-2 applies for the integration of apparatus on rolling stock.

The frequency range considered is from DC to 400 GHz. No measurements need to be performed at frequencies where no requirement is specified.

The application of tests depends on the particular apparatus, its configuration, its ports, its technology and its operating conditions.

This document takes into account the internal environment of the railway rolling stock and the external environment of the railway, and interference to the apparatus from equipment such as hand-held radio-transmitters.

If a port is intended to transmit or receive for the purpose of radio communication (intentional radiators, e.g. transponder systems), then the radiated emission requirement in this document is not intended to be applicable to the intentional transmission from a radio-transmitter as defined by the ITU.

Immunity limits do not apply in the exclusion bands as defined in the corresponding EMC related standard for radio equipment.

This document does not apply to transient emissions when starting or stopping the apparatus.

The objective of this document is to define limits and test methods for electromagnetic emissions and immunity test requirements in relation to conducted and radiated disturbances.

These limits and tests represent essential electromagnetic compatibility requirements.

Emission requirements have been selected so as to ensure that disturbances generated by the apparatus operated normally on railway rolling stock do not exceed a level which could prevent other apparatus from operating as intended. The emission limits given in this document take precedence over emission requirements for individual apparatus on board the rolling stock given in other standards.

Likewise, the immunity requirements have been selected so as to ensure an adequate level of immunity for rolling stock apparatus.

Test requirements are specified for each port considered.

These specific provisions are used in conjunction with the general provisions in IEC 62236-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60571:2012, *Railway applications – Electronic equipment used on rolling stock*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-30:2015, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*

IEC 61000-6-4:2006, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*
IEC 61000-6-4:2006/AMD1:2010

IEC 62236-1:2018, *Railway applications – Electromagnetic compatibility – Part 1: General*

IEC 62236-3-1:2018, *Railway applications – Electromagnetic compatibility – Part 3-1: Rolling stock – Train and complete vehicle*

CISPR 16-2-1:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

SOMMAIRE

AVANT-PROPOS	23
1 Domaine d'application	25
2 Références normatives	26
3 Termes, définitions et termes abrégés	27
3.1 Termes et définitions	27
3.2 Termes abrégés	27
4 Critères d'aptitude à la fonction	28
5 Conditions pendant les essais	28
6 Applicabilité	28
7 Essais d'émission et limites	29
8 Exigences d'immunité	32
Annexe A (informative) Exemples d'appareils et d'accès	37
Annexe B (informative) Perturbations conduites générées par les convertisseurs de puissance	43
 Figure 1 – Principales catégories d'accès	 27
Figure A.1 – Unité motrice alimentée en courant alternatif avec traction en courant alternatif et filtre psophométrique côté ligne	40
Figure A.2 – Système en courant alternatif/courant alternatif avec filtre d'amélioration du facteur de puissance côté convertisseur et avec réseau d'alimentation train et auxiliaire en courant continu ou triphasé	40
Figure A.3 – Système conventionnel avec entrée en courant alternatif et moteurs de traction en courant continu alimentés par convertisseur à contrôle de phase	41
Figure A.4 – Système d'alimentation en courant continu avec traction en courant alternatif	41
Figure A.5 – Autres accès de convertisseur et électronique de commande	42
Figure B.1 – Montage d'essai	43
 Tableau 1 – Émission – Accès par les bornes d'alimentation auxiliaire en courant alternatif et en courant continu (entrée et sortie)	 30
Tableau 2 – Émission – Alimentation batterie (entrée et sortie)	31
Tableau 3 – Immunité – Accès référencés à la batterie (sauf en sortie des sources d'énergie), accès par les bornes d'entrée d'alimentation auxiliaire en courant alternatif (tension assignée $\leq 480 V_{eff}$)	33
Tableau 4 – Immunité – Accès par les lignes de commande et de mesure de processus, de communication et de signalisation	34
Tableau 5 – Immunité – Accès par l'enveloppe	35
Tableau A.1 – Exemples types d'appareils	38
Tableau A.2 – Descriptions des accès types	39
Tableau B.1 – Exigences relatives aux émissions pour les accès par les bornes d'alimentation en courant alternatif et en courant continu	43

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 3-2: Matériel roulant – Appareils

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 62236-3-2 a été établie par le comité d'études 9 de l'IEC: Matériels et systèmes électriques ferroviaires.

Cette troisième édition annule et remplace la deuxième édition publiée en 2008. Elle constitue une révision technique et a été développée sur la base de EN 50121-3-2:2015.

Cette édition inclut les changements techniques significatifs suivants par rapport à l'édition précédente:

- a) clarification du domaine d'application (Article 1);
- b) nouvelles définitions des accès et clarification dans les Tableaux 1 à 5;
- c) exigences d'émissions étendues dans la plage de fréquences 1 GHz à 6 GHz, suivant l'IEC 61000-6-4;

- d) exigences d'immunité étendues dans la plage de fréquences 5,1 GHz à 6 GHz;
- e) révision de l'Annexe B.

Cette Norme internationale doit être lue conjointement avec l'IEC 62236-1.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
9/2338/FDIS	9/2368/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 62236, publiées sous le titre général *Applications ferroviaires – Compatibilité électromagnétique*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

APPLICATIONS FERROVIAIRES – COMPATIBILITÉ ÉLECTROMAGNÉTIQUE –

Partie 3-2: Matériel roulant – Appareils

1 Domaine d'application

La présente partie de l'IEC 62236 s'applique aux aspects d'émission et d'immunité de CEM des appareils électriques et électroniques destinés à être utilisés à bord du matériel roulant ferroviaire. L'IEC 62236-3-2 s'applique pour l'intégration des appareils à bord du matériel roulant.

La plage de fréquences concernée va du courant continu à 400 GHz. Aucune mesure n'est nécessaire aux fréquences pour lesquelles aucune exigence n'est spécifiée.

L'application des essais dépend des appareils eux-mêmes, de leur configuration, de leurs accès, de leur technologie et de leurs conditions de fonctionnement.

Le présent document prend en compte l'environnement interne du matériel roulant ferroviaire et l'environnement externe du système ferroviaire, ainsi que les perturbations affectant les appareils provenant d'équipements tels que les émetteurs radioélectriques portables.

Si un accès est destiné à émettre ou recevoir des communications radio (émetteurs intentionnels de rayonnement, par exemple, systèmes de balise), alors les exigences relatives aux émissions rayonnées du présent document ne s'appliquent pas à la transmission intentionnelle à partir d'un émetteur radio tel que défini par l'UIT.

Les limites d'immunité ne s'appliquent pas dans les bandes d'exclusion telles que définies dans la norme CEM correspondante pour les équipements radio.

Le présent document ne s'applique pas aux émissions de transitoires lors du démarrage ou de l'arrêt des appareils.

L'objectif du présent document est de définir les limites et les méthodes d'essai concernant les émissions électromagnétiques et les exigences relatives aux essais d'immunité en matière de perturbations conduites et rayonnées.

Ces limites et ces essais représentent les exigences essentielles de compatibilité électromagnétique.

Les exigences relatives aux émissions ont été choisies pour assurer que les perturbations générées par l'appareil qui fonctionne normalement à bord du matériel roulant ferroviaire ne dépassent pas un niveau qui pourrait empêcher d'autres appareils de fonctionner comme prévu. Les limites d'émission données dans le présent document l'emportent sur les exigences relatives aux émissions des appareillages individuels embarqués sur le matériel roulant données dans les autres normes.

De la même manière, les exigences relatives à l'immunité ont été choisies pour assurer un niveau approprié d'immunité pour les appareils du matériel roulant.

Les exigences relatives aux essais sont spécifiées pour chaque accès considéré.

Ces dispositions spécifiques sont utilisées avec les dispositions générales données dans l'IEC 62236-1.

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60571:2012, *Applications ferroviaires – Équipements électroniques utilisés sur le matériel roulant*

IEC 61000-4-2:2008, *Compatibilité électromagnétique (CEM) – Partie 4-2: Techniques d'essai et de mesure – Essai d'immunité aux décharges électrostatiques*

IEC 61000-4-3:2006, *Compatibilité électromagnétique (CEM) – Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Compatibilité électromagnétique (CEM) – Partie 4-4: Techniques d'essai et de mesure – Essai d'immunité aux transitoires électriques rapides en salve*

IEC 61000-4-5:2014, *Compatibilité électromagnétique (CEM) – Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes de choc*

IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs radioélectriques*

IEC 61000-4-30:2015, *Compatibilité électromagnétique (CEM) – Partie 4-30: Techniques d'essai et de mesure – Méthodes de mesure de la qualité de l'alimentation*

IEC 61000-6-4:2006, *Compatibilité électromagnétique (CEM) – Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels*

IEC 61000-6-4:2006/AMD1:2010

IEC 62236-1:2018, *Applications ferroviaires – Compatibilité électromagnétique – Partie 1: Généralités*

IEC 62236-3-1:2018, *Applications ferroviaires – Compatibilité électromagnétique – Partie 3-1: Matériel roulant – Trains et véhicules complets*

CISPR 16-2-1:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites*

CISPR 32:2015, *Compatibilité électromagnétique des équipements multimédia – Exigences d'émission*